



EFFICACY OF FUNGICIDES AND ANTIBIOTICS AGAINST SPORE GERMINATION AND PER CENT DISEASE INCIDENCE OF *COLLETOTRICHUM FALCATUM* CAUSING RED ROT OF SUGARCANE

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Abstract

Experiments were carried out to assess the efficacy of certain antibiotics and fungicides against *Colletotrichum falcatum*, the causal organism of sugarcane red rot disease. Among the three antibiotics and twelve systemic and non-systemic fungicides tested, the antibiotic streptomycin and the fungicide thiobendazole recorded the maximum inhibition of spore germination at the least concentration of 500ppm. Poisoned Food Techniques revealed that thiobendazole followed by streptomycin and carbendazim @ 500 ppm recorded the maximum mycelial inhibition of the pathogen. Modified Paper Disc Method revealed the superiority of thiobendazole and carbendazim @ 500 ppm against the mycelial growth of the pathogen recording 100 & 91.1 per cent mycelial inhibition respectively. Under field conditions among the diseased setts treated with different antibiotics and fungicides, setts treated with thiobendazole at 0.2% followed by carbendazim recorded the maximum germination percentage and the least per cent disease incidence.

Key words: antibiotics and fungicides, *Colletotrichum falcatum*, *Saccharum Officinarum*. L.

Introduction

Sugarcane (*Saccharum Officinarum*. L.), is one of the major commercial crops in India and plays an important role in the economy of India. It is grown in the tropical and sub-tropical regions of the world. All over 100 fungi, 10 bacteria, 10 viruses and 50 species of nematodes are known to infect sugarcane in different part of the world. (Subhani, *et al.*, 2008). Among various factors responsible of yield loss, fungal disease are the major cause gaining interational importance. Sugarcane red rot disease caused by *Colletotrichum falcatum* is one of the major constraints in the profitable cultivation of sugarcane (Chana, 1980). In India, the disease is most destructive in the sub-tropical parts of the country and coastal areas of Andhra Pradesh and Tamil Nadu. Certain systemic and non-systemic and antibiotics were used to find out some effective chemical and antibiotics may control infection of red rot of sugarcane. The main objective of present studies was to find out comparative efficacy and specificity of certain fungicides and antibiotics against *Colletotrichum falcatum* to obtain an economical and ecofriendly control of this disease.

Materials and Methods

Poison food technique

In this study the efficacy of selective systemic and nonsystemic and certain antibiotics were tested against *Colletotrichum falcatum* under *in vitro* conditions. 10 sysetmic and 10 non-systemic fungicides and three antibiotics each at 10, 50, 100, 500, 1000, and 2000 ppm concentrations were used. These fungicides and antibiotics were mixed separately in the sterilized PDA medium to get the final desired concentration. A disc (7mm in diameter) obtained from the periphery of 7 days old fungal culture of the pathogen grown on PDA medium was placed in the centre of the petri plate. After 7 days incubation @ 28±2°C the radial growth of the pathogen was measured. The PDA medium without having any fungicides and antibiotics served as control. Percentage inhibition of *Colletotrichum falcatum* when compared to control was calculated by using following formula (Vincent, 1927).

$$\text{Per cent inhibition} = C-T/100,$$

where C=Colony growth in control,

T= Colony growth in treatment

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Spore germination-hanging drop technique (Y. P Bharti *et al.*, 2014)

The studies were made at room temperature employing different concentration of fungicides of antibiotics. The spores of pathogen were allowed to germinate in the hanging drop technique of the respective concentrations of the chemicals with sterile distilled water was maintained as control. Percentage germination of spores was observed after 24 hours.

Modified paper disc technique

Evaluation of the selected antibiotics and fungicides was also done by modified paper disc method of (Lakshman *et al.*, 1973 & Gupta 1980). 15 mm assay discs were cut from whatmann 45 filter paper and each disc was impregnated separately with 1 ml solution of the respective solution by repeated soaking and air drying. The assay disc were aseptically placed in the centre, one in each of the petriplate containing sterilized medium corresponding controls (with discs soaked in distilled water) were also maintained and 2mm disc of mycelia out from periphery of 7 days old culture of the test fungus was aseptically placed in the centre of assay disc in the inverted portion so that the fungus comes in direct contact with the disc. The observations were recorded in terms of colony diameter.

Field Experiment

Field experiments were laid out in small plots in the field. Field experiment was conducted by randomized block design with three replication. Diseased setts were soaked for 30 minutes in 0.2% solution of the selected antibiotics and fungicides *viz.*, Carbendazim, Thiobendazole, tetracycline and Streptocycline, separately. The treated setts and control setts were planted separately following the usual cultural practices. The diseased plants as soon as observed were uprooted and destroyed in order to avoid secondary spread of the disease.

Result

The inhibitory effect of three antibiotics and twelve fungicides were tested against the spore germination of *Colletotrichum falcatum*. The data from the table indicates that the antibiotics showed better results at lower concentrations than several fungicides tested. At 500 ppm concentration, all the antibiotics tested gave 91-100% inhibition of spore germination whereas streptocycline and thiobendazole recorded 100% inhibition. At 1000 ppm Eurocidin, Aureofungin,

carbendazim and vitavax recorded 100% inhibition.

Evaluation of antibiotics and fungicides *viz.*, Streptocycline, Tetracycline, Carbendazim, Thiobendazole against the mycelial growth of the pathogen at different concentrations *viz.*, 100 ppm, 500 ppm & 1000 ppm along with control was carried out. The results revealed that Thiobendazole was the most effective in checking the mycelial growth @ 500 ppm concentration recording a 100% inhibition. This was followed Streptocycline, Carbendazim and Terracycline recording 92.72%, 52.72% and 49.09% mycelial inhibition respectively. At 1000 ppm concentration Thiobendazole, Carbendazim and Streptocycline recorded a complete inhibition of the mycelium.

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Evaluation of the selected antibiotics and fungicides at different concentrations were done by modified Paper Disc Method (Table 3). The observation was recorded

Table 1: Efficacy of fungicides and antibiotics against spore germination of *Colletotrichum falcatum* in vitro.

Sl. No.	Fungicides & Antibiotics	Spore germination percentage				
		50ppm	100ppm	500ppm	1000ppm	1500ppm
1	Aureofungin	16	13	07	00	00
2	Streptocycline	27	17	00	00	00
3	Eurocidin	18	12	09	00	00
4	Maneb	53	33	18	11	04
5	Aretan	50	41	14	13	11
6	Captan	52	37	42	18	12
7	Terraclor	28	18	12	11	02
8	Benelate	37	22	18	18	08
9	Brestan	47	42	39	15	04
10	Vitavax	34	21	12	00	00
11	Carbendazim	38	17	12	00	00
12	Thiobendazole	22	15	00	00	00
13	Thiophanate	50	37	28	16	02
	S.Ed.	1.72	2.20	2.54	0.89	0.31
	C.D(P=0.05)	3.5	4.6	5.1	1.8	0.62

Table 2: Effect on selected chemicals on the mycelial growth of *C. falcatum* by Poison Food Technique.

Chemicals/ antibiotics	Chemicals in ppm concentration					
	100ppm		500ppm		1000ppm	
	Colony (dia)	Percentage inhibition	Colony (dia)	Percentage inhibition	Colony (dia)	Percentage inhibition
Tetracycline	2.6	52.72	2.8	49.09	1.2	78.12
Streptomycin	1.4	74.54	0.4	92.72	0.00	100
Carbendazim	4.2	23.63	2.6	52.72	0.00	100
Thiobendazole	3.1	43.63	0.0	100	0.00	100
Control	5.5	-	5.5	-	5.5	-

Table 3: Effect on chemical/antibiotics on the mycelial growth of *C. falcatum* by modified paper disc techniques.

Chemicals/ antibiotics	Chemicals in ppm concentration					
	100ppm		500ppm		1000ppm	
	Colony (dia)	Percentage inhibition	Colony (dia)	Percentage inhibition	Colony (dia)	Percentage inhibition
Tetracycline	2.3	48.88	0.7	84.44	0.00	100
Streptomycin	1.3	71.10	0.8	82.22	0.00	100
Carbendazim	2.8	37.77	0.4	91.10	0.00	100
Thiobendazole	1.2	73.33	0.00	100	0.00	100
Control	4.5	-	4.5	-	4.5	-

in terms of colony diameter. It is clear that the Thiobendazole alone completely checked the mycelial growth completely even at 500 ppm concentration. Carbendazim, tetracycline and streptomycin showed inhibitory effect but to a lesser degree recording 91.1%, 84.44% and 82.2% mycelial inhibition respectively.

The infected setts, treated as well as corresponding control setts both (healthy and diseased) canes were planted separately. The diseased plants were observed, the germination percentage & disease incidence were calculated and are presented in table 4.

The results reveal that setts treated with

Table 4: Effect on chemical / antibiotics on the Percentage germination and Percentage incidence of red rot disease in sugarcane.

Sl. No.	Chemicals / antibiotics	Percentage germination(%)	Percent incidence (%)
1	Tetracycline	53.2	39.1
2	Carbendazim	64.8	28.8
3	Thiobendazole	68.6	28.1
4	Streptomycin	55.4	39.0
5	Untreated (control)	26.4	90.2
6	Healthy (control)	92.8	9.7
	S.Ed.	2.58	3.15
	C.D(P=0.05)	5.16	6.34

Thiobendazole @ 2% conc. showed a germination percentage of 68.6% & percent disease incidence of 28.1% followed by Carbendazim and Streptomycin recording germination percentage of 64.8 & 28.8% and percent disease incidence of 55.4 & 39.0% respectively. The untreated control showed the least germination percentage 26.4% and the maximum per cent disease 90.2%.

Discussion

Systemic fungicides were more effective in controlling the pathogen than the non-systemic fungicides (Vijaya *et al.*, 2007). Systemic fungicides Carbendazim & Propiconazole were found to be more effective in complete inhibition of the pathogen at (0.05 %) concentration, while among non-systemic fungicides, Thiram was found to be the best, followed by Captan at both

concentration (0.1-0.2%), whereas Mancozeb & Copper oxychloride were less effective. These fungicides were able to completely control the secretion of cellulolytic & pectinolytic enzyme by the test pathogen (Mehta *et al.*, 2009). Among these, PCNB, Bavistin, Streptomycin, and Carbendazim give best result in 800 and 1000 ppm (Bharati *et al.*, 2014). Those findings support the present findings.

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